EXHIBIT 18

UNITED STATES DISTRICT COURT

DISTRICT OF MINNESOTA

MOLDEX METRIC, INC., Plaintiff, vs. 3M COMPANY and 3M INNOVATIVE PROPERTIES COMPANY, Defendants.	Court File No._: 14-cv-01821-JNE/FLN **[PROPOSED] FIRST AMENDED COMPLAINT FOR MONOPOLIZATION AND ATTEMPTED MONOPOLIZATION (SHERMAN ACT SECTION 2), UNFAIR COMPETITION (CALIFORNIA BUSINESS AND PROFESSIONS CODE SECTION 17200), AND MALICIOUS PROSECUTION** **JURY TRIAL DEMANDED**

NATURE OF THE ACTION

3M, one of the largest corporations in the world, has a history of using patent litigation to drive its smaller competitors from the markets in which 3M participates. In 2012, 3M filed a baseless patent lawsuit in United States District Court for the District of Minnesota against its much-smaller rival, Culver City-based Moldex Metric, Inc., in order to drive Moldex from the market for non-linear, or selective attenuation, earplugs approved for use by the U.S. Military—earplugs specifically designed to significantly attenuate the loud impulse sounds of battlefield explosions, while still allowing the wearer to hear commands spoken by fellow soldiers in the field. 3M's patent claims were

baseless and were brought only to try to directly drive Moldex from the market controlled by 3M due to the cost and burden of baseless patent litigation. To bolster the threat it was making, 3M also accused Moldex of infringing a different 3M patent, based on separate earmuff products that Moldex was selling, even though Moldex had been selling these earmuffs for almost a decade prior to the suit, and even though Moldex had invented its accused earmuff products before the priority date of the asserted 3M patent.

Contrary to 3M's expectations, Moldex did not relent in the face of this sham patent lawsuit. Instead, Moldex stood and fought against 3M's abusive conduct, incurring significant legal fees and costs, and suffering considerable disruptions to Moldex's business in the process. Realizing that 3M faced certain loss on these baseless claims, 3M then unilaterally dropped its infringement claims, dismissing them all with prejudice. Indeed, 3M dismissed the first of its claims immediately before a hearing on Moldex's motion for summary judgment of non-infringement regarding that claim. And 3M dropped the second of its infringement claims as Moldex was preparing to file a motion for summary judgment as to the invalidity of that latter patent claim. But the damage had already been done—Moldex had been forced to incur immense legal costs and suffer significant business disruptions. And even since dismissing its sham patent infringement claims, 3M has continued to use other predatory means to monopolize the market, including misusing the Javits-Wagner-O'Day ("JWOD") government contracting process, and otherwise competing unfairly. For example, 3M continues to market its dual-ended Combat Arms earplug with a "0" NRR based on ratings by its own in-house personnel. This "0" rating is highly misleading and anticompetitive, and it creates a false

expectation in wearers that, in open position, they can hear critical sounds such as commands, approaching vehicles or combatants without any impairment. Moldex brings this lawsuit, therefore, in order to seek recompense for the harm it has suffered as a result of 3M's anticompetitive and monopolistic practices, and for injunctive relief to protect it against 3M's on-going predatory conduct.

In addition, by pursuing 3M's patent infringement claims, despite knowing that they were both objectively and subjectively baseless, 3M committed malicious prosecution. Moldex therefore seeks compensatory and punitive damages to compensate it for the harm it suffered as a result and to punish 3M for its wrongful conduct and thereby deter a recurrence of such malicious and wanton conduct.

THE PARTIES

1. Plaintiff Moldex Metric, Inc. ("Moldex") is a California corporation with its principal place of business in Culver City, California. It is in the business of designing, manufacturing and selling worker safety products, including hearing protection products and respirators.

2. Defendant 3M Company ("3M Company") is a corporation organized and existing under the laws of the state of Delaware with its principal place of business in St. Paul, Minnesota. It is in the business, among others, of designing, making and selling worker safety products, including hearing protectors and respirators. 3M has a dominant market share in virtually every safety product market relevant to this litigation.

3. Defendant 3M Innovative Properties Company ("3M Innovative") is a corporation organized and existing under the laws of the state of Delaware with its

principal place of business in St. Paul, Minnesota. It is an affiliate of 3M Company, and it is the entity that 3M uses to hold and assert its intellectual property assets. 3M Company and 3M Innovative are sometimes referred to collectively herein as "3M" or as "the 3M Defendants."

JURISDICTION AND VENUE

4. This action arises under the antitrust laws of the United States, 15 U.S.C. §1 et seq., and under state law.

5. This Court has subject matter jurisdiction over Moldex's federal antitrust claims pursuant to 15 U.S.C. §§ 4, 15, 16, and 26, and under 28 U.S.C. § 1337. In addition, this Court has subject matter over this action, including the state law claims, by virtue of 28 U.S.C. §1332, in that this is an action between citizens of different States. This Court also has supplemental jurisdiction over Moldex's state law claims pursuant to 28 U.S.C. § 1367.

6. This Court has personal jurisdiction over the 3M Defendants because they are citizens of the State of Minnesota and because at least part of the conduct complained of by Moldex took place in the State of Minnesota.

7. Venue is proper in this judicial district under 15 U.S.C. § 22 and 28 U.S.C. § 1391.

NATURE OF TRADE AND COMMERCE

8. This action involves, among other things, "non-linear," or "selective attenuation" earplugs purchased and used by the U.S. Military to protect soldiers' hearing from the harmful effects of battlefield explosions. Non-linear earplugs block or attenuate

sounds of different amplitude and frequency to differing degrees, by using a sound channel that has various constrictions and openings for the passage of sound from the exterior to the wearer's ear canal. As a result, they can be worn by soldiers in the field so that the soldiers are protected from the intense impulse sounds of battlefield explosions, while still being able to communicate by speech with their colleagues. These earplugs can have an additional plug or other mechanism that can be used to block this selective-attenuation sound channel, so as to provide a more fulsome hearing protection effect with a completely closed earplug, just like a traditional earplug.

9. The United States military is the largest purchaser of these earplug products in the United States. The military purchases the vast majority of such products sold every year in this country. The military can only purchase these products if they meet the testing standards required by the U.S. Army Public Health Command, Army Hearing Program, or equivalent standards that may be promulgated by other military services.

10. This action also involves a type of hearing protector called an earmuff. An earmuff is a product that protects the wearer from the harmful effects of excessive sound energy by covering the wearer's ear with a muff-like object that covers the entire exterior of the wearer's ear. These products often have layers of material on the inside, to mute even further the sound energy that is transmitted into the wearer's ear canal.

11. Hearing protectors, including earplugs and earmuffs, are sold with a listed Noise Reduction Rating. A Noise Reduction Rating ("NRR") is a measurement called for by certain measurement standards, and by certain federal regulations that have adopted those measurement standards. This rating represents the amount of sound attenuation

perceived by a test group, when tested under certain required conditions, and adjusted pursuant to the test methodology. These tests can be unfairly biased either willfully or unwittingly, by tester error, subject anomaly, and/or tester bias. As a result, many companies have an independent outside lab conduct their NRR testing. Moldex does this. 3M does not. Instead, 3M has its own personnel conduct these tests, in a lab approved for such testing, but run entirely by 3M personnel.

RELEVANT MARKET(S)

12. 3M's activities in this case relate to one or more relevant markets. These markets include the following product markets, in the conjunctive or in the alternative: (a) a product market for non-linear earplugs that are approved for purchase by the United States military; (b) the product market for non-linear earplugs; (c) the product market for non-linear earplugs that have dual modes of setting, with one mode including a non-linear sound channel and one mode including a fully blocked earplug; and/or (d) the product market for passive (non-electronic) industrial earmuffs (the "Relevant Product Market(s)").

13. The relevant geographic market for each of the product markets described above is the United States ("the Relevant Geographic Market").

3M'S ANTICOMPETITIVE, UNLAWFUL, AND UNFAIR CONDUCT

14. For several years, 3M has manufactured and sold a non-linear earplug called Combat Arms. There have been four different versions of this product, but each version has used a sound channel with constrictions and openings to produce its non-linear sound attenuation effect. Such selective-attenuation sound channels are well known

in the art, and they have been used for decades. These Combat Arms earplugs also have allowed the user to set the earplug for a second mode of operation, where the non-linear sound channel is blocked, by inserting a plug into the channel or otherwise, so that it will then function like a traditional fully blocked earplug. This dual-mode feature is also well known in the art, and this feature was not invented by 3M, nor is it the invention claimed in any of the patents that 3M baselessly accused Moldex of infringing.

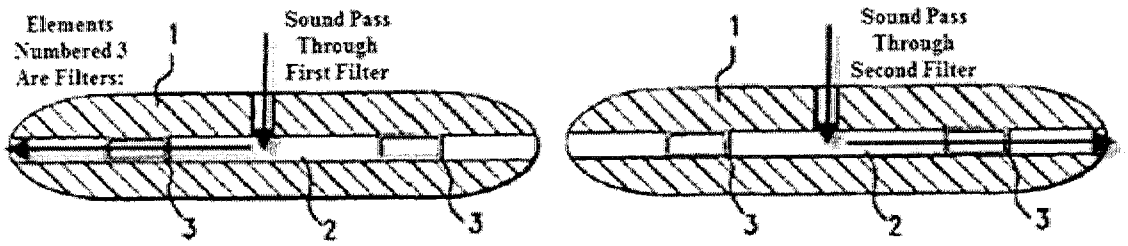
15. In 2011, Moldex introduced its own non-linear dual-mode earplug, called BattlePlug. Moldex's BattlePlug provided the first actual competition to 3M's Combat Arms earplug in the market for non-linear earplugs approved for purchase by the military. Moldex provided BattlePlug samples and pricing to the U.S. military in February of 2011, and the U.S. military gave its first order for BattlePlugs in or about May of 2011.

16. Moldex alleges, on information and belief, that prior to Moldex's entry into the market, and at the time 3M sued Moldex in the prior patent litigation, 3M controlled approximately 100% of the market for non-linear earplugs approved for purchase by the military, and that 3M continues to hold a dominate share of this market. Further, Moldex alleges, on information and belief, that at all times relevant to this action, in the product market for non-linear earplugs generally, 3M held a dominate share of the market.

17. 3M wanted to block Moldex from entering this market, and 3M decided to take whatever actions it could to block the entry. Among other things, 3M decided to, and did, file suit against Moldex, in March of 2012, in United States District Court for the District of Minnesota (*3M Property & 3M Innovative Properties Company v. Moldex-Metric, Inc.*, 12-CV-611-JNE-FLN). 3M's lawsuit accused Moldex of infringing U.S.

Patent No. 6,070,693 ("the '693 patent"), a patent that had been assigned to 3M some time before. However, the '693 patent claims that 3M asserted against Moldex were objectively baseless, and this must have been apparent to 3M.

18. As indicated above, non-linear earplugs that have a second mode of attenuation with the sound channel fully blocked were well known in the industry and are not the invention claimed in the '693 patent. Instead, the '693 patent identified a possible issue with the known dual-mode selective attenuation earplugs where the blocked mode was attained by inserting a plug in the sound channel or otherwise blocking it, namely, that there may be difficulty in actually using the plug or other mechanism to block the sound channel. The '693 patent claimed an alternative way to achieve two different levels of sound attenuation in a single earplug, namely, having a dual-ended earplug, where each end was insertable into the user's ear, and each end provided a different level of attenuation. As disclosed in the patent, such an earplug would have a non-linear sound channel running from one end to a hole at the mid-point of the plug, so that exterior sound would enter through the center hole, be filtered by the sound channel, and then reach the wearer's ear in attenuated form. And the other end of the earplug could be a fully blocked earplug, or be an earplug with a channel running from the center hole to the other end of the earplug with a different sound channel structure so as to provide a different level of non-linear sound attenuation. An annotated version of Figure 2 from the '693 patent shows this dual ended structure:



19. There is no question that the '693 patent was limited to such dual-ended earplugs. Indeed, the specification of the '693 patent makes this abundantly clear at numerous points, including the following:

> "**The present invention has two ends, that may or may not be identical, either of which can be inserted into the auditory canal, thus making it possible to choose between two operating modes of attenuation that may or may not be identical.**"

20. 3M did make a dual-ended version of this product for some time, but 3M has since offered a more traditional structure, where the second mode is attained by blocking the non-linear sound channel with a plug or block operated by a toggle valve.

21. Moldex's BattlePlug earplug does not infringe the '693 patent, and this was obvious from the outset. Among other reasons, Moldex's earplug is not a dual-ended earplug, the only type of earplug claimed in the '693 patent. Instead, it has only one end that can be inserted into the users' ear. Indeed, BattlePlug has the same structure as the prior art products that 3M knew about and that are described on the face of the '693 patent as prior art. The '693 patent expressly distinguishes its invention over these single-ended prior art earplugs by virtue of its dual-ended structure. For this and other reasons, the '693 patent could not possibly read on the BattlePlug earplug, and 3M must have realized this fact before they sued Moldex on the patent.

22. Further, when 3M sued Moldex on the '693 patent in March of 2012, Moldex immediately informed 3M that there was no conceivable way that its product could infringe the '693 patent. Nonetheless, 3M continued to pursue the claims against Moldex under the '693 patent, seeking, among other things, injunctive relief intended to force Moldex from the market.

23. At the same time that 3M sued Moldex over its BattlePlug earplug, 3M also asserted a separate patent claim against a different Moldex product, namely, Moldex's M-series earmuff. Specifically, as part of the patent lawsuit, 3M alleged that Moldex's M-series earmuffs infringed United States Patent No. 7,036,157 (the '157 patent) owned by 3M. This patent covered an earmuff that had two separate materials on its outer surface, to limit somewhat sound transmission across the exterior muff surface. However, Moldex had first introduced its accused M-series earmuffs in 2001, almost five years before the '157 patent issued. And, because of the length of time it takes to develop such a product, 3M knew, or should have known, that Moldex had in fact invented its accused M-series earmuffs well before the priority date of the '157 patent. (Moldex is informed and believes, and alleges thereon, that 3M and its predecessor did not inform the patent office of the existence of Moldex's prior art M-series products during prosecution of the '157 patent, and that this might have been done to defraud the patent office. Moldex will seek leave to amend this complaint, to add a claim under *Walker Process* on this basis, should discovery confirm that 3M's agents committed such fraud on the PTO.)

24. When 3M sued Moldex on the '157 patent in March of 2012, Moldex immediately informed 3M of Moldex's prior invention of its accused M-series earmuffs, but 3M nonetheless pursued the claims aggressively.

25. On or about January 18, 2013, Moldex filed a motion in the patent lawsuit for summary judgment of non-infringement of the '693 patent. The hearing on that motion was set for March 21, 2013. One week before that hearing, however, and after the motion was fully briefed by both sides, 3M, seeking to avoid its claim from being adjudicated as baseless, sent Moldex a covenant not to sue, as to the '693 patent and the BattlePlug earplug. Based on this covenant, 3M took the position that the United States District Court for the District of Minnesota no longer had jurisdiction to hear the claims relating to the '693 patent, including Moldex's dispositive motion of non-infringement, and 3M indicated its intent to obtain dismissal of its infringement claims against Moldex with respect to the '693 patent. Ultimately, 3M filed a motion to dismiss its claims with respect to the '693 patent with prejudice, and to dismiss Moldex's counterclaims of non-infringement and invalidity of the '693 patent without prejudice. On June 19, 2013, the United States District Court for the District of Minnesota dismissed 3M's claims against Moldex, under the '693 patent, with prejudice, and the Court dismissed without prejudice Moldex's claim for a declaration that it did not infringe the '693 patent.

26. However, even after it sent its covenant not to sue Moldex on the '693 patent, 3M continued to pursue its claims against Moldex's M-series earmuffs under the '157 patent, even though it was clear that Moldex had invented its accused products prior to the invention of the '157 patent. 3M imposed great expense on Moldex in connection

with 3M's pursuit of these claims, including demanding expensive, burdensome, disruptive and irrelevant document searches, as well as depositions of eight Moldex employees and former employees: Jeff Birkner, Jim Hornstein, Bernard Mishkin, Terry Grimsley, Norman Smith, Michael Scholey, Dan Dix and Steve Young. Moldex is informed and believes and alleges that 3M undertook this campaign of intense discovery in order to impose huge costs on Moldex, so as to attempt to force Moldex to settle the case, and not pursue Moldex's rights, including those asserted here, all as part of 3M's efforts to unlawfully obtain and/or maintain monopoly power.

27. Then, in or about May of 2013, after the close of fact discovery, and as Moldex was in the process of preparing a motion for summary judgment that the '157 patent was invalid as a result of Moldex's prior invention, 3M sent Moldex another covenant not to sue, this time with respect to the '157 patent and the M-series earmuffs. Once again, 3M stated, the Court now lacked jurisdiction to determine the validity of the '157 patent, because of 3M's covenant not to sue. The parties then informed the Court of this development, and, on June 19, 2013, the United States District Court for the District of Minnesota granted 3M's request to dismiss with prejudice its infringement claims based on the '157 patent, and the Court dismissed without prejudice Moldex's claim for a declaration that the '157 patent was invalid, as that issue was mooted by the dismissal of the infringement claim.

28. In connection with 3M's dismissals of its infringement claims described above, 3M sent letters to Moldex claiming that 3M was dismissing its claims against Moldex not because they were without merit, even though that was clearly the case, but

instead, because continuing the claims did not make economic sense given the size of Moldex's sales of its accused products. However, this was clearly a mere pretext, designed to try to construct a defense to the claims being asserted here. Indeed, since Moldex is continuing to sell its BattlePlug products to the U.S. military, and since 3M continues to try to interfere with those sales, it is clear that 3M did not dismiss these claims for economic reasons. Instead, 3M did so because it knew they were baseless and that it was going to lose the claims on the merits.

29. Although 3M has now abandoned both of its baseless patent infringement claims, 3M's pursuit of those claims, in bad faith, has imposed significant costs and damages on Moldex, in the form of legal fees, costs, and lost employee time, in an amount well in excess of $1 million. Furthermore, 3M has used, and continues to use, predatory conduct in its efforts to sell into the Relevant Product Market(s). In this regard, 3M has attempted to use a federal program designed to further the use of disabled workers, called JWOD, to exclude Moldex from said Markets, by engaging in misleading assertions concerning BattlePlug and a comparison of it to Combat Arms. In addition, 3M continues to use misleading NRRs for its hearing protection products, based on self-testing it does in its own labs. Specifically, 3M continues to sell its dual-ended version of Combat Arms with an NRR of zero in the open or unblocked position, thus suggesting that the open earplug will not in any way impair the sounds one hears from fellow soldiers or combatants in the field. This zero rating is based upon an improper testing effort, not in compliance with proper procedures.

30. Indeed, in the reported underlying test, 3M basically concluded that the Combat Arms earplug would actually enhance the sound level of the wearer as compared to wearing no earplug at all. In a letter to Moldex's counsel, dated June 27, 2012, 3M provided the results of a January 25, 2000, NRR test ("NRR Test") conducted by 3M's personnel on the open position of Combat Arms earplug. 3M bases its Combat Arms open-position zero NRR on these test results. This letter, and the test results, are attached as Exhibit A. The NRR Test concluded that the Combat Arms earplug had an NRR of -2.0, meaning that, in the open position, the earplug actually enhances the wearer's sound level by two decibels. This result alone should have alerted 3M to its improper testing procedures, and 3M's knowledge of the inaccurate result is further evidenced by the fact 3M chose to advertise a zero NRR on its Combat Arms earplug instead of the actual result of its faulty NRR test.

31. The improper result of 3M's NRR Test arose because two of the ten test subjects used in the NRR Test showed an extreme range of variability across trials. Test subjects were given three trials apiece at nine different frequencies, and the subjects' attenuation was reported (in decibels) for each trial. Test subjects GWG and TRS reported extreme ranges of attenuation across trials on the majority of tested frequencies. Page 3 of Exhibit A. For instance, at the 1000 hertz frequency, GWG reported decibel attenuations of 18, -1, and 5 across three trials; resulting in a range of 19 decibels. Page 2 of Exhibit A. These extreme ranges show that GWG's and TRS's attenuation results were unreliable, and should have been excluded because they were clear outliers.

32. Moldex alleges, on information and belief, that most other test subjects showed meaningful attenuation in the open-position, and, had GWG's and TRS's results been excluded, 3M would have had to report a NRR greater than zero on the open-position of its Combat Arms earplug. However, Moldex alleges, on information and belief, that 3M's personnel did not exclude GWG's and TRS's attenuation results from its -2.0 NRR calculation. Moldex alleges, on information and belief, that 3M may have justified including both of these test subjects' attenuation results in its final NRR calculation based on its use of the Dixon Outlier Test, as set forth in the procedure manual used by 3M personnel to perform NRR testing. See Appendix III of the Policies and Procedures Manual for the Cabot Safety Corporation E-A-RCAL Acoustical Laboratory, attached as Exhibit B. However, Moldex alleges, on information and belief, that the Dixon Outlier Test can only be used to identify a single outlier in a small sample; the test breaks down when a sample has multiple outliers, which is what happened in the present case. See http://www.nmschembio.org.uk/GenericArticle.aspx?m=395&amid=5620. By improperly including GWG's and TRS's NRRs of -8.3 and -7.9, respectively, 3M artificially deflated the NRR on the Combat Arms earplug to -2.0.

33. Moldex is also informed and believes and thereon alleges that 3M advertises a NRR of 7 or greater on later versions of its Combat Arms earplugs, further indicating that its advertised zero NRR is false and misleading, and the result of improper testing procedures.

34. Although 3M has asserted that the "0" NRR is not a violation of the Noise Control Act, 42 U.S.C. § 4901, because, 3M claims, an understatement of sound attenuation is not prohibited by that Act, it is nonetheless the case that this advertised rating is intended to inform the military that Combat Arms does not diminish the ability to hear commands, or approaching combatants or vehicles. As a result, the "0" NRR is highly misleading, misleads users of the plug, and anticompetitive. Moldex, on the other hand, elected over 15 years ago to test all of its hearing protection products in an independent, industry-recognized audiology laboratory to assure that its advertised NRRs are accurate.

First Claim For Relief

Sham Litigation: Monopolization and Attempted Monopolization

Under 15 U.S.C. §§ 2

35. Moldex restates and incorporates herein by reference paragraphs 1-29 of this Complaint, as though fully set forth herein.

36. 3M's patent lawsuit, and in particular, the claims asserted under the '693 patent therein, were objectively and subjectively baseless. These meritless claims were brought by 3M in bad faith as an anticompetitive weapon to attempt to force Moldex from the Relevant Product Market and to attempt to interfere directly with Moldex's business relationships. Further, 3M pursued its claims under the '157 patent with full knowledge that those claims were invalid, for improper and anticompetitive reasons, including to put financial pressure on Moldex and thereby to force it to accede to 3M's

demands, and to cease selling its BattlePlug products, and to prevent it from asserting the claims asserted herein.

37. By virtue of the foregoing, 3M has sought to maintain its monopoly power in the Relevant Market(s), and/or it has attempted to monopolize such Market(s) and there is a dangerous probability that, but for the acts of Moldex in fighting the baseless litigation, 3M would have succeeded in its scheme.

38. Moldex has been damaged in its business and property by virtue of these acts by 3M, in an amount to be proven at trial, but believed to be in excess of $1 million. Under 15 U.S.C. §15, Moldex is entitled to treble the amount of its antitrust damages. In addition, by virtue of this same section, Moldex is entitled to its fees and costs incurred in bringing and pursuing this antitrust action.

Second Claim For Relief

Malicious Prosecution

39. Moldex restates and incorporates herein by reference paragraphs 1-33 of this Complaint, as though fully set forth herein.

40. By suing Moldex on the '693 patent, and by suing Moldex on the '157 patent or by continuing with that suit even after it had been fully informed of Moldex's prior invention, 3M brought and/or pursued litigation claims that were objectively baseless and that 3M knew were baseless.

41. Moldex is informed and believes, and alleges thereon, that, in undertaking these actions, 3M has caused damage to Moldex, including Moldex's defense costs in defending against both the '693 and the '157 patent claims in the patent lawsuit, and the

disruption to Moldex's business as a result that predatory litigation. Further, Moldex is informed and believes and alleges thereon that 3M's acts were willful, wanton, malicious and oppressive, in that 3M was motivated by malicious intent and ill will and an improper desire to exclude Moldex from a market in which 3M profited mightily. Therefore, Moldex reserves the right, consistent with the legal standards for such a claim, to move to amend Moldex's complaint to seek an award of punitive damages.

42. 3M's patent lawsuit against Moldex was terminated in Moldex's favor based on 3M's voluntary dismissal of its claims.

Third Claim for Relief

Unfair Competition Under Cal. Bus. and Prof. Code § 17200

43. Moldex restates and incorporates herein by reference paragraphs 1-37 of this Complaint, as though fully set forth herein.

44. The acts of 3M, as herein alleged, constitute unlawful, unfair and deceptive business practices in violation of California Business and Professions Code §17200 *et seq*. Such acts include, without limitation, 3M's initiation and prosecution of groundless litigation, 3M's unlawful distribution and sale of Combat Arms earplugs with an advertised NRR of zero or advertisements suggesting that a user's hearing or situational awareness are unaffected in violation of federal and state law, 3M's unfair competition and false advertising in connection with the marketing and sale of Combat Arms earplugs in violation of California Business and Professions Code § 17500 *et seq*., and 3M's deceptive statements regarding the open end of the Combat Arms earplugs as alleged above.

45. As a result of 3M's conduct, Moldex has suffered and will continue to suffer damage to its business, reputation, and goodwill.

46. 3M's conduct has caused, and unless enjoined by this Court, will continue to cause, immediate and irreparable harm to Moldex for which there is no adequate remedy at law, and for which Moldex is entitled to injunctive relief.

Prayer for Relief

WHEREFORE, for its prayer for relief, Moldex prays for judgment as follows:

1. On Moldex's First claim for relief, for treble Moldex's damages, according to proof at trial, and for Moldex's attorneys' fees and costs incurred in pursuing said claim, in accordance with the antitrust laws of the United States;

2. On Moldex's First claim for relief, a permanent injunction enjoining Defendants and their officers, agents, servants, employees, and attorneys, and those persons in active concert or participation with them, from conducting future predatory acts of monopolization, including the use of misleading NRR numbers and the use of improper testing procedures;

3. On Moldex's Second claim for relief, for actual damages according to proof at trial, and for punitive damages according to proof at trial;

4. On Moldex's Third claim for relief, that 3M and all of its respective officers, agents, servants, representatives, employees, attorneys, and all other persons acting in concert with them be permanently enjoined from:

a. directly or indirectly engaging in false advertising, marketing and/or promotions of any kind relating to the ostensibly non-sound attenuating yellow "open" end of the Combat Arms earplug;

b. making or inducing others to make any false, misleading or deceptive statement of fact, or misrepresentation of fact in connection with the marketing, promotion, sale, offering for sale, manufacture, production, or distribution of Combat Arms earplugs;

5. On Moldex's Third claim for relief, for a determination that 3M be adjudged to have violated California Business and Professions Code § 17200 et seq. by unlawfully and unfairly competing against Moldex and be enjoined from further such violations;

6. On all claims, for prejudgment interest;

7. On all claims, for attorneys' fees and costs; and

8. For such other relief as the Court deems just and proper.

JURY TRIAL DEMAND

Pursuant to Federal Rule of Civil Procedure 38(b), Plaintiffs hereby demand a trial by jury on all issues triable by jury.

Date: August ___, 2014

By:_____

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ATTORNEYS FOR PLAINTIFF MOLDEX-METRIC, INC.

E-A-RCAL ATTENUATION TEST REPORT PER ANSI S3.19-1974

NVLAP Lab
Code 100374-0

DEVICE: Combat Arms Plug
ARC Plug

DEVICE TYPE: Premolded, Level-dependent Plug

MANUFACTURER: E-A-R/Aearo

TEST DATE: January 25, 2000 **TEST ID#: 213016**

SUBJECTS/SAMPLES: 10/10 **NRR (per EPA-1979): -2.0**

BAND FORCE (N): NA

FITTING PROCEDURE: EPA/Experimenter Fit **POSITION: NA**

Test Frequency (Hz)	Mean Attenuation (dB)	Standard Deviation (dB)
125	4.7	4.0
250	4.2	4.3
500	6.0	5.0
1000	9.5	6.7
2000	16.7	4.9
3150	18.6	5.7
4000	16.3	5.8
6300	16.7	6.1
8000	17.2	6.8

Performed by: Ronald W. Kieper
Ronald W. Kieper
Sr. Acoustic Technician

Reviewed by: Elliott H. Berger
Elliott H. Berger
Manager, Acoustical Engineering

Comments: See report #213017 for results of UltraFit end of plug.

This report pertains only to the samples and subjects tested. It may not be used to claim product endorsement by NVLAP, or any other agency of the U.S. Government.

EXHIBIT A

INDIVIDUAL SUBJECT DATA

Test ID: 213016 Device: Combat Arms Plug
Date: 1/25/00 Samples: 10 Position: NA Comfort: 2.6
Comments:

Subj.	Trial	1/3 Octave-Band Frequency 125	250	500	1000	2000	3150	4000	6300	8000	125 Comf.	Canal Size	NRR*
KJC	1	5	6	7	16	21	24	24	18	14	1	S/S+	9.2
	2	5	6	9	16	21	22	22	14	13	3		
	3	1	4	11	19	20	25	23	16	16	3	2	
MKF	1	2	3	11	18	22	28	26	16	17	3	XS-/XS-	10.4
	2	3	6	11	17	23	27	25	15	13	6		
	3	3	7	13	16	22	32	25	18	12	1	4	
GWG	1	-2	3	8	18	24	21	21	21	23	2	M/M+	-8.3
	2	0	-1	-2	-1	9	12	7	14	10	1		
	3	4	-1	3	5	13	19	14	14	16	4	3	
BAK	1	3	6	4	11	17	18	21	25	26	4	XL/XL	2.6
	2	5	3	8	12	17	15	13	29	29	3		
	3	9	4	0	8	15	20	18	28	32	6	2	
RTM	1	2	-4	0	2	13	17	14	6	11	1	L/M+	-5.5
	2	3	2	6	5	14	13	14	12	10	3		
	3	2	-5	-5	-2	13	10	7	8	9	2	1	
DLP	1	4	5	9	10	21	22	19	15	17	5	L+/L+	8.3
	2	7	7	12	15	21	21	20	22	27	8		
	3	6	8	9	15	27	23	18	25	22	3	1	
TLS	1	3	3	2	1	11	12	12	11	12	1	M+/M	-0.6
	2	8	4	5	3	14	14	12	21	20	6		
	3	2	2	2	0	7	15	9	7	9	2	1	
TRS	1	4	11	8	17	15	14	17	17	22	2	S/S	-7.9
	2	1	2	-1	0	9	8	5	8	5	-2		
	3	4	0	2	3	10	14	8	9	10	2	2	
MV	1	13	11	9	14	17	19	16	21	23	15	M/M+	7.9
	2	13	9	7	11	15	24	20	22	18	12		
	3	16	15	14	14	18	22	18	23	25	13	2	
JMW	1	8	6	13	11	18	17	17	17	21	6	M/M+	0.5
	2	2	2	4	6	17	16	13	13	15	1		
	3	5	1	2	6	17	13	12	15	20	3	8	
Mean		4.7	4.2	6.0	9.5	16.7	18.6	16.3	16.7	17.2	4.0	2.6	1.7
sd(30)		4.0	4.3	5.0	6.7	4.9	5.7	5.8	6.1	6.8	3.8	----	----
sd(10)		3.6	3.7	3.9	5.6	4.3	5.4	5.1	5.5	5.7		2.1	7.2
Q-Value		12.8	4.2	-0.7	-3.8	5.7		4.9		5.2			

NRR (2sd) = -2.0 (1sd) = 3.8 (0sd) = 9.4 NRR* - Individual 2sd NRR

DIXON'S OUTLIER TEST: EXTREME RANGES

Test ID: 213016 Device: Combat Arms Plug

Range in attenuation in dB across trials

	1/3 Octave-Band Frequency								
Subj.	125	250	500	1000	2000	3150	4000	6300	8000
KJC	4	2	4	3	1	3	2	4	3
MKF	1	4	2	2	1	5	1	3	5
GWG	6	4	10	19	15	9	14	7	13
BAK	6	3	8	4	2	5	8	4	6
RTM	1	7	11	7	1	7	7	6	2
DLP	3	3	3	5	6	2	2	10	10
TLS	6	2	3	3	7	3	3	14	11
TRS	3	11	9	17	6	6	12	9	17
MV	3	6	7	3	3	5	4	2	7
JMW	6	5	11	5	1	4	5	4	6
Mean	3.9	4.7	6.8	6.8	4.3	4.9	5.8	6.3	8.0
Max.	6	11	11	19	15	9	14	14	17
r	0.000	0.444	0.000	0.125	0.571	0.333	0.167	0.364	0.286

Extreme value rejected if r > 0.477. One-sided test of significance at p<0.05.
Rejected values are shaded.

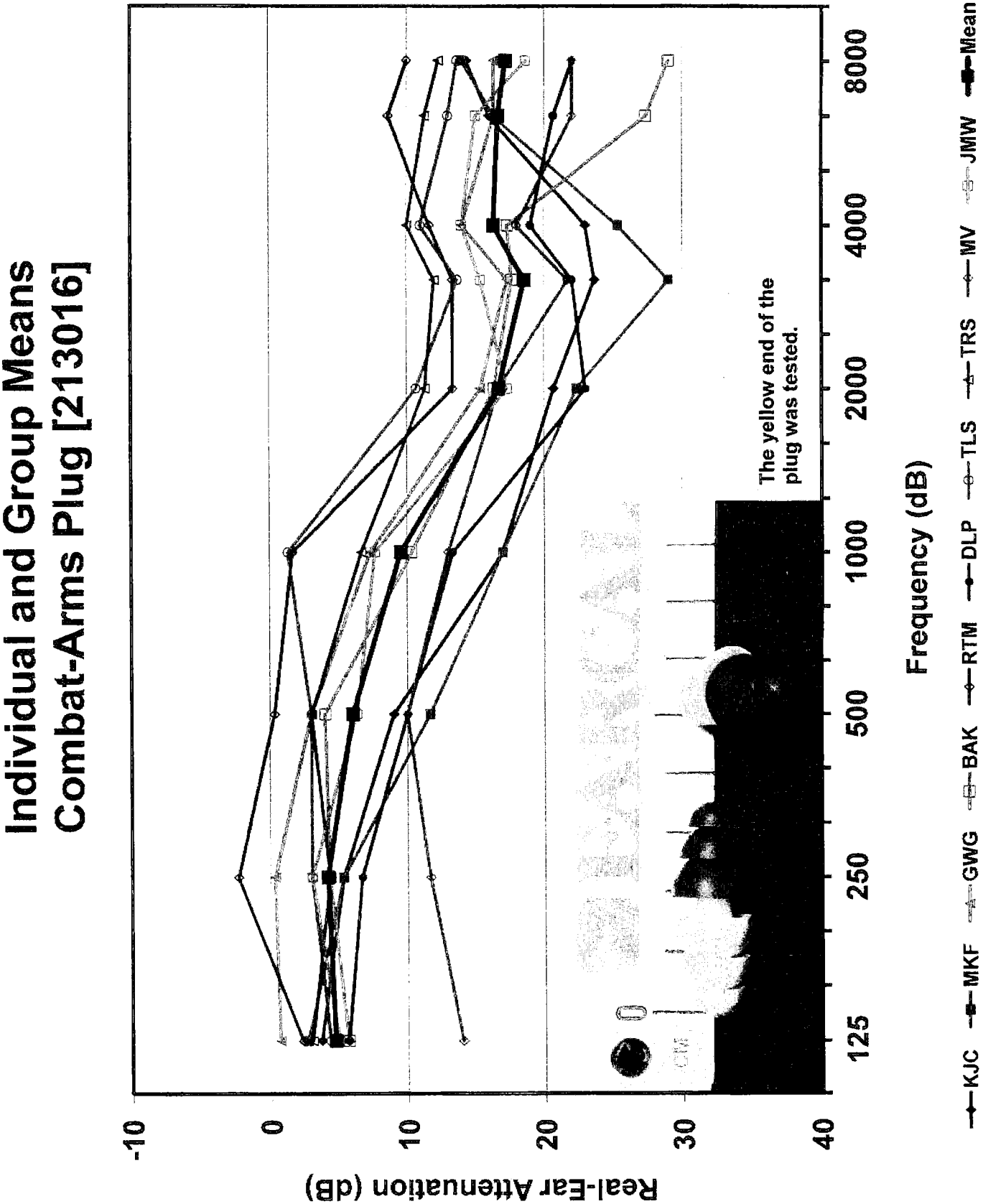
DIXON'S OUTLIER TEST: EXTREME MEANS

Test ID: 213016 Device: Combat Arms Plug

Mean attenuation in dB across trials

	1/3 Octave-Band Frequency								
Subj.	125	250	500	1000	2000	3150	4000	6300	8000
KJC	3.7	5.3	9.0	17.0	20.7	23.7	23.0	16.0	14.3
MKF	2.7	5.3	11.7	17.0	22.3	29.0	25.3	16.3	14.0
GWG	0.7	0.3	3.0	7.3	15.3	17.3	14.0	16.3	16.3
BAK	5.7	4.3	4.0	10.3	16.3	17.7	17.3	27.3	29.0
RTM	2.3	-2.3	0.3	1.7	13.3	13.3	11.7	8.7	10.0
DLP	5.7	6.7	10.0	13.3	23.0	22.0	19.0	20.7	22.0
TLS	4.3	3.0	3.0	1.3	10.7	13.7	11.0	13.0	13.7
TRS	3.0	4.3	3.0	6.7	11.3	12.0	10.0	11.3	12.3
MV	14.0	11.7	10.0	13.0	16.7	21.7	18.0	22.0	22.0
JMW	5.0	3.0	6.3	7.7	17.3	15.3	14.0	15.0	18.7
Mean	4.7	4.2	6.0	9.5	16.7	18.6	16.3	16.7	17.2
Min.	0.7	-2.3	0.3	1.3	10.7	12.0	10.0	8.7	10.0
Max.	14.0	11.7	11.7	17.0	23.0	29.0	25.3	27.3	29.0
Low r	0.333	0.296	0.276	0.021	0.057	0.114	0.077	0.200	0.194
High r	0.714	0.441	0.192	0.000	0.057	0.340	0.163	0.333	0.420

Extreme value rejected if r > 0.551. Two-sided test of significance at p<0.05.
Rejected values are shaded.


Individual and Group Means
Combat-Arms Plug [213016]
Real-Ear Attenuation (dB)
-10
0
10
20
30
40
125
250
500
1000
2000
4000
8000
Frequency (dB)
The yellow end of the plug was tested.
KJC
MKF
GWG
BAK
RTM
DLP
TLS
TRS
MV
JMW
Mean
c:\myfiles\...\213016.xls:Graph
Page 5 of 5

E-A-RCAL ATTENUATION TEST REPORT PER ANSI S3.19-1974

NVLAP Lab
Code 100374-0

DEVICE: Combat Arms Plug
ARC Plug

DEVICE TYPE: Premolded, Level-dependent Plug

MANUFACTURER: E-A-R/Aearo

TEST DATE: January 25, 2000 **TEST ID#: 213016**

SUBJECTS/SAMPLES: 10/10 **NRR (per EPA-1979): -2.0**

BAND FORCE (N): NA

FITTING PROCEDURE: EPA/Experimenter Fit **POSITION: NA**

Test Frequency (Hz)	Mean Attenuation (dB)	Standard Deviation (dB)
125	4.7	4.0
250	4.2	4.3
500	6.0	5.0
1000	9.5	6.7
2000	16.7	4.9
3150	18.6	5.7
4000	16.3	5.8
6300	16.7	6.1
8000	17.2	6.8

Performed by: Ronald W. Kieper
Ronald W. Kieper
Sr. Acoustic Technician

Reviewed by: Elliott H. Berger
Elliott H. Berger
Manager, Acoustical Engineering

Comments: See report #213017 for results of UltraFit end of plug.

INDIVIDUAL SUBJECT DATA

Test ID: 213016 Device: Combat Arms Plug
Date: 1/25/00 Samples: 10 Position: NA Comfort: 2.6
Comments:

Subj.	Trial	1/3 Octave-Band Frequency 125	250	500	1000	2000	3150	4000	6300	8000	125 Comf.		Canal Size	NRR*
KJC	1	5	6	7	16	21	24	24	18	14	1		S/S+	9.2
	2	5	6	9	16	21	22	22	14	13	3			
	3	1	4	11	19	20	25	23	16	16	3	2		
MKF	1	2	3	11	18	22	28	26	16	17	3		XS-/XS-	10.4
	2	3	6	11	17	23	27	25	15	13	6			
	3	3	7	13	16	22	32	25	18	12	1	4		
GWG	1	-2	3	8	18	24	21	21	21	23	2		M/M+	-8.3
	2	0	-1	-2	-1	9	12	7	14	10	1			
	3	4	-1	3	5	13	19	14	14	16	4	3		
BAK	1	3	6	4	11	17	18	21	25	26	4		XL/XL	2.6
	2	5	3	8	12	17	15	13	29	29	3			
	3	9	4	0	8	15	20	18	28	32	6	2		
RTM	1	2	-4	0	2	13	17	14	6	11	1		L/M+	-5.5
	2	3	2	6	5	14	13	14	12	10	3			
	3	2	-5	-5	-2	13	10	7	8	9	2	1		
DLP	1	4	5	9	10	21	22	19	15	17	5		L+/L+	8.3
	2	7	7	12	15	21	21	20	22	27	8			
	3	6	8	9	15	27	23	18	25	22	3	1		
TLS	1	3	3	2	1	11	12	12	11	12	1		M+/M	-0.6
	2	8	4	5	3	14	14	12	21	20	6			
	3	2	2	2	0	7	15	9	7	9	2	1		
TRS	1	4	11	8	17	15	14	17	17	22	2		S/S	-7.9
	2	1	2	-1	0	9	8	5	8	5	-2			
	3	4	0	2	3	10	14	8	9	10	2	2		
MV	1	13	11	9	14	17	19	16	21	23	15		M/M+	7.9
	2	13	9	7	11	15	24	20	22	18	12			
	3	16	15	14	14	18	22	18	23	25	13	2		
JMW	1	8	6	13	11	18	17	17	17	21	6		M/M+	0.5
	2	2	2	4	6	17	16	13	13	15	1			
	3	5	1	2	6	17	13	12	15	20	3	8		
Mean		4.7	4.2	6.0	9.5	16.7	18.6	16.3	16.7	17.2	4.0	2.6		1.7
sd(30)		4.0	4.3	5.0	6.7	4.9	5.7	5.8	6.1	6.8	3.8	----		----
sd(10)		3.6	3.7	3.9	5.6	4.3	5.4	5.1	5.5	5.7		2.1		7.2
Q-Value		12.8	4.2	-0.7	-3.8	5.7		4.9		5.2				

NRR (2sd) = -2.0 (1sd) = 3.8 (0sd) = 9.4 NRR* - Individual 2sd NRR

DIXON'S OUTLIER TEST: EXTREME RANGES

Test ID: 213016 Device: Combat Arms Plug

Range in attenuation in dB across trials

	1/3 Octave-Band Frequency								
Subj.	125	250	500	1000	2000	3150	4000	6300	8000
KJC	4	2	4	3	1	3	2	4	3
MKF	1	4	2	2	1	5	1	3	5
GWG	6	4	10	19	15	9	14	7	13
BAK	6	3	8	4	2	5	8	4	6
RTM	1	7	11	7	1	7	7	6	2
DLP	3	3	3	5	6	2	2	10	10
TLS	6	2	3	3	7	3	3	14	11
TRS	3	11	9	17	6	6	12	9	17
MV	3	6	7	3	3	5	4	2	7
JMW	6	5	11	5	1	4	5	4	6
Mean	3.9	4.7	6.8	6.8	4.3	4.9	5.8	6.3	8.0
Max.	6	11	11	19	15	9	14	14	17
r	0.000	0.444	0.000	0.125	0.571	0.333	0.167	0.364	0.286

Extreme value rejected if r > 0.477. One-sided test of significance at p<0.05.
Rejected values are shaded.

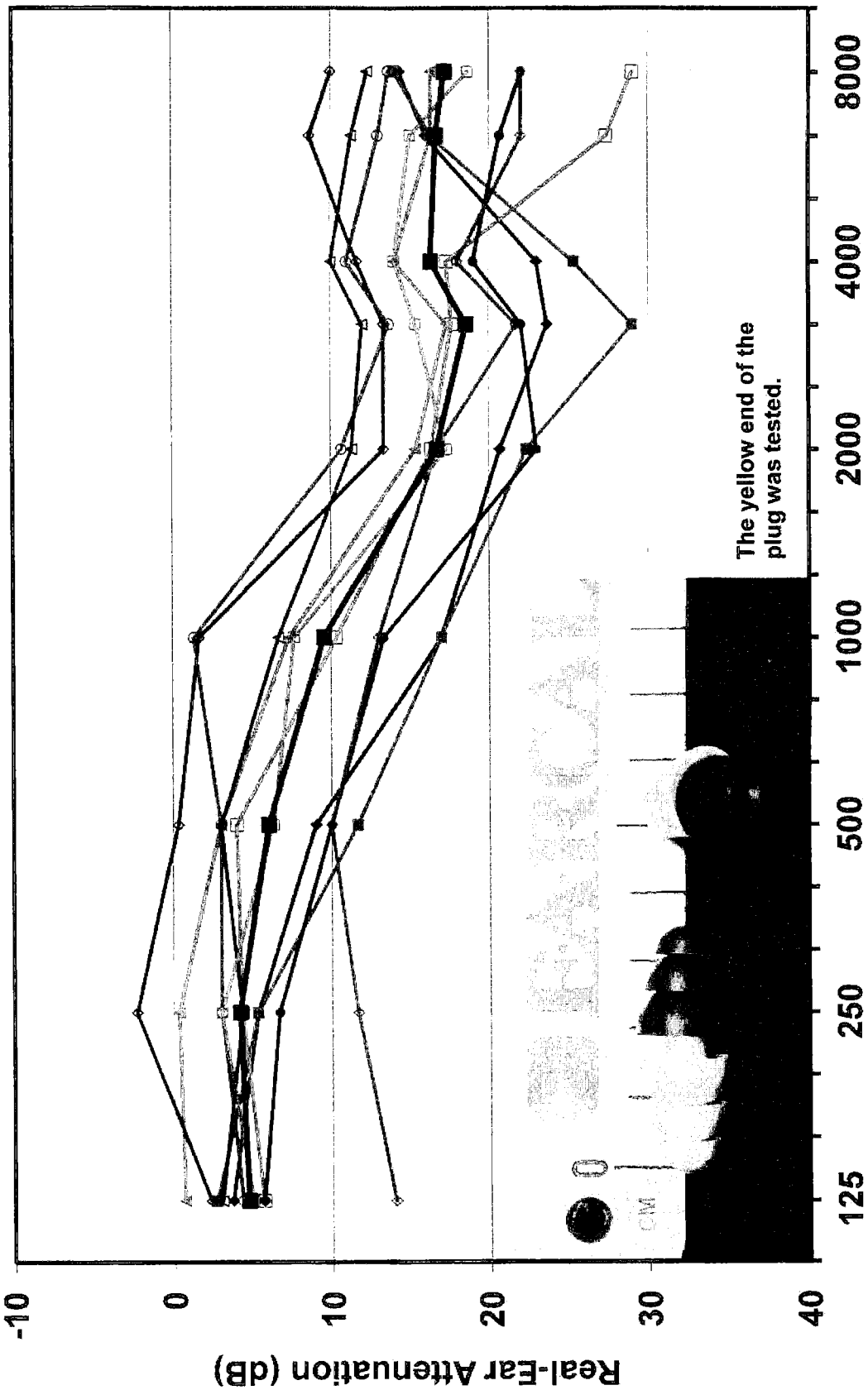
DIXON'S OUTLIER TEST: EXTREME MEANS

Test ID: 213016 Device: Combat Arms Plug

Mean attenuation in dB across trials

	1/3 Octave-Band Frequency								
Subj.	125	250	500	1000	2000	3150	4000	6300	8000
KJC	3.7	5.3	9.0	17.0	20.7	23.7	23.0	16.0	14.3
MKF	2.7	5.3	11.7	17.0	22.3	29.0	25.3	16.3	14.0
GWG	0.7	0.3	3.0	7.3	15.3	17.3	14.0	16.3	16.3
BAK	5.7	4.3	4.0	10.3	16.3	17.7	17.3	27.3	29.0
RTM	2.3	-2.3	0.3	1.7	13.3	13.3	11.7	8.7	10.0
DLP	5.7	6.7	10.0	13.3	23.0	22.0	19.0	20.7	22.0
TLS	4.3	3.0	3.0	1.3	10.7	13.7	11.0	13.0	13.7
TRS	3.0	4.3	3.0	6.7	11.3	12.0	10.0	11.3	12.3
MV	14.0	11.7	10.0	13.0	16.7	21.7	18.0	22.0	22.0
JMW	5.0	3.0	6.3	7.7	17.3	15.3	14.0	15.0	18.7
Mean	4.7	4.2	6.0	9.5	16.7	18.6	16.3	16.7	17.2
Min.	0.7	-2.3	0.3	1.3	10.7	12.0	10.0	8.7	10.0
Max.	14.0	11.7	11.7	17.0	23.0	29.0	25.3	27.3	29.0
Low r	0.333	0.296	0.276	0.021	0.057	0.114	0.077	0.200	0.194
High r	0.714	0.441	0.192	0.000	0.057	0.340	0.163	0.333	0.420

Extreme value rejected if r > 0.551. Two-sided test of significance at p<0.05.
Rejected values are shaded.


Individual and Group Means
Combat-Arms Plug [213016]
Real-Ear Attenuation (dB)
-10
0
10
20
30
40
125
250
500
1000
2000
4000
8000
Frequency (dB)
The yellow end of the plug was tested.
KJC
MKF
GWG
BAK
RTM
DLP
TLS
TRS
MV
JMW
Mean

CABOT SAFETY CORPORATION
90 Mechanic Street, Southbridge, MA 01550, (508) 764-5500

March 2, 1993

Mr. Bernard Miskin
Vice President - Marketing
Moldex Metric Inc.
4671 Leahy Street
Culver City, CA 90232-3592

Dear Bernard,

It was a pleasure meeting you and discussing the future ANSI Hearing Protection Standard during the NHCA meeting. As I mentioned during our conversation, enclosed is the E-A-RCAL Policies and Procedures Manual.

This document describes the rigmarole we have to comply with in order to maintain our status as an accredited laboratory. Should you have any questions or need clarifications, please do not hesitate to give me a call.

I look forward seeing you again at the next ISEA battle in Washington March 23 - 24.

Regards

Fredrik Lindgren, Ph.D.
Director,
Research and Development

EXHIBIT B

Policies and Procedures Manual for the Cabot Safety Corporation E•A•RCAL℠ Acoustical Laboratory re ANSI S3.19-1974 and ANSI S12.6-1984

E-A-R 91-41/HP

Elliott H. Berger, M.S., Mem. INCE
Ronald W. Kieper, A.A.S., C.O.H.C.

Cabot Safety Corporation
7911 Zionsville Road
Indianapolis, IN 46268-1657
phone: 317-872-1111
fax: 317-872-0617

November 26, 1991

Version 2.0

E•A•RCAL℠ Laboratory is accredited by the National Institute of Standards and Technology, National Voluntary Laboratory Accreditation Program, for the measurement of attenuation of hearing protection devices re ANSI S3.19-1974 and ANSI S12.6-1984

ABSTRACT

Policies and procedures by which E•A•RCAL℠ Laboratory, Cabot Safety Corporation's acoustical laboratory, conducts real-ear attenuation at threshold (REAT) testing re ANSI S3.19-1974 and ANSI S12.6-1984 are defined and described. The report states the project acceptance policies and fees, specifies the instrumentation and calibration schedule, describes the staff qualification and training requirements, and then goes on to detail the procedures involving experimental test subjects, the handling of test samples, attenuation testing, and the handling of data and statistical procedures. A sample hearing protection device test report is included. E•A•RCAL policies for complaint resolution, and use of the NVLAP logo on laboratory reports are also presented.

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acoustical technician(s) 6

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Handling test samples 12

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I - Sample HPD Test Report

II - Complete list of equipment utilized for ANSI S3.19/S12.6 test procedures

III - Statistical procedures for rejecting outlier data

IV - Excerpts from Natrella (1966), Chapter 17

Report (see Appendix I). Once the data are entered, the file is stored with a new name (XXXXXX.wq1) corresponding to the Test ID#. The spreadsheet is printed out and the individual attenuation values for each subject, at each frequency, for each fitting, are checked against the audiogram cards by having one person read the data to the technician who created the file.

The means and standard deviations are then also entered into a WordPerfect file (REATcvr.wp) to create page 1 of the HPD Test Report, into another Quattro Pro spreadsheet (NRRcalc.wq1) to create page 5 of the Report, and into the Hearing Protection Data Analysis (HPDA) data base (also found on the Novell local area network, see below) for comparative analyses to other E•A•RCAL, as well as out-of-house data.

All the computer files are stored on a local area network, 640 mega-byte Novell Netware File Server, and backed up daily on a 2.2 giga-byte Emerald Systems VAST tape drive operated by Palindrome's Network Archivist program. Additionally, page 1 of each XXXXXX.wq1 file which contains the individual subject data (page 2 of the HPD Test Report) is backed up on 5-¼" discs that are stored in the Acoustical Laboratory.

Hard copies of pages 1 - 4 of the HPD Test Reports are filed in the Acoustical Laboratory.

STATISTICAL PROCEDURES

The following sections of S3.19 and S12.6 direct the experimenter to discard certain outlier data:

S3.19; 3.2.3 - ... *In reporting the results, listeners for whom an adequate fit cannot be obtained should be noted, but should not be included in the evaluation.*

S12.6; 3.2.4 - ... *In reporting the results, listeners for whom a good fit cannot be obtained shall be noted, but should not be included in the evaluation.*

Unfortunately, neither standard provides specific guidance on how this is to be accomplished.

Experience at E•A•RCAL Laboratory has indicated that an objective method of removing outliers from REAT data is necessary in order to provide internal consistency and comparability between test results. Beginning in 1980, we chose to utilize objective statistical tests instead of relying solely on the bias or judgement of the Laboratory Director (E-A-R 80-17/HP). The current procedures, somewhat modified since that time, reflect the same general practices that we have found useful during the intervening decade.

Statistical tests and determination of the need for retest or replacement of subjects occurs at the conclusion of all tests on all subjects. The complete set of data (normally 10 subjects x 3 evaluations per subject) is then analyzed for outliers using the Dixon Criterion (Natrella, 1966, Chapter 17). The statistical tests consist of comparing both the range of each subject's attenuation values, as well as their mean attenuation values across replications, to the other subjects in the test panel.

The exact procedures and formulae for conducting the statistical tests are presented in Appendix III. Selected portions of Natrella's Chapter 17 are reproduced in Appendix IV.

The final test report (see Appendix I) will note any rejections, the reasons for them, and their effects on the computation of the NRR. The audiogram cards which contain the actual rejected data are stored in the card files together with the remaining (accepted) data.

DESCRIPTION OF THE HPD TEST REPORT

The HPD Test Report that describes the results of an S3.19 or S12.6 attenuation test consists of a cover sheet and six pages. An example appears in Appendix I. A description of the six pages of the test report follows:

Page 1 provides a description of the test devices, important test parameters, the fitting procedure utilized for the test, mean attenuation and standard deviation values at the frequencies which were tested, and when statistical failures occur, the results of the statistical tests and an indication of any subjects who were rejected or retested.

Page 2 presents the attenuation data for each trial with each subject, as well as information on the comfort rating (see Figure 6), subject's canal size, and individual NRRs (computed using each subject's mean attenuation and standard deviation values). At the bottom of the table the mean attenuation, the standard deviation across all subjects and trials [sd(30)], the standard deviation across the average attenuation values for the subjects [sd(10); computed from the values on page 4 of the report], as well as the NRRs computed with 2-standard-deviation (2sd), 1-standard-deviation (1sd), and 0-standard-deviation (0sd) corrections are all listed, as is (when applicable) the device band force before and after testing.

Page 3 is the statistical test for extreme ranges (see Appendix III. The values shown for each subject are the

APPENDIX III

Statistical procedures for rejecting outlier data

PURPOSE AND OVERVIEW

The purpose of the following tests is to exclude aberrant results due to either an unusual inability of a subject to consistently fit an HPD (as measured by their range of attenuation values across the multiple, usually three, fittings of the device), or to the dissimilarity of his or her mean attenuation values with respect to the other subjects tested. The procedures are applied after all subjects (not less than 10) have been tested.

The following description assumes 10 subjects x 3 measurements per subject. To apply the statistics to other sample sizes, see Appendix V.

All probability tests are conducted at the $p<0.05$ level using the Dixon Criterion (Natrella, 1966). First the data are tested for repeatability of data within subjects using a one-sided test [$r_{1-\alpha}$ is looked up in Table A-14 (see Appendix V of this report)], and then tested for similarity of mean attenuation values across subjects using a two-sided test [$r_{1-\alpha/2}$ is looked up in Table A-14].

The procedures are directly applicable to EPA/Experimenter Fit and S12.6 Experimenter-Supervised Fit tests. When applying the statistical procedures to E•A•RCAL Experimenter Fit tests, step B4 is changed to:

> "Subjects who fail this test are retested. If they fail a second time, they may be replaced if, in the Laboratory Director's judgement there is reason to believe that the subject cannot be properly fitted with the device under test."

Statistical Test Procedures (November, 1991)

A1. **RANGE TEST:** Compute the individual range in attenuation values across the three measurements for each subject at each frequency.

A2. A one-sided Dixon test is used to determine if any subject's value is aberrantly large:

At each frequency, arrange the individual range values in ascending order:
$X_1, X_2, \ldots X_9, X_{10}$

Calculate $r_{11} = (X_{10} - X_9)/(X_{10} - X_2)$

The value is considered an outlier if $r_{11} > 0.477$*

A3. A subject fails this test if his/her data are found to be outliers at two or more frequencies.

A4. Subjects who fail this test are retested. If the same subject fails a second time, s/he is replaced with another subject.

A5. Whether or not the retest or replacement data fail a subsequent Range test, or cause the ranges of any of the other subjects to become outliers, no further rejections for aberrant ranges are permitted. If the original, retest, and replacement data all fail the Range test, the Laboratory Director shall determine which of the data shall be included in the final report.

A6. At this point, the experimenter proceeds to phase two of the outlier testing (Step B1).

B1. **MEAN VALUE TEST:** Compute the average attenuation values across the three measurements for each subject at each frequency.

B2. A two-sided Dixon test is used to determine if any subject's value is aberrantly small or large:

At each frequency, arrange the mean attenuation values in ascending order:
$X_1, X_2, \ldots X_9, X_{10}$

To test for a value that is **too small**, calculate $r_{11} = (X_2 - X_1)/(X_9 - X_1)$

To test for a value that is **too large**, calculate $r_{11} = (X_{10} - X_9)/(X_{10} - X_2)$

The values are considered outliers if $r_{11} > 0.551$**

B3. A subject fails this test if his/her data are found to be outliers at two or more frequencies.

B4. Subjects who fail this test are replaced with another subject.***

B5. Whether or not the replacement subject fails a subsequent Mean Value test, or causes any of the other subjects to become outliers, no further rejections for aberrant attenuation values are permitted. If the original and replacement data both fail the Range test, the Laboratory Director shall determine which of the data shall be included in the final test report.

B6. The results of all Range and Mean Value statistical test failures, and their effects on the NRR, are to be stated in the test report.

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* One-sided test of significance at $p<0.05$
** Two-sided test of significance at $p<0.05$
*** See note, prior page, re modification of this step when applied to *E•A•RCAL Exp.-Supervised Fit.*

APPENDIX IV

Excerpts from Natrella (1966), Chapter 17

CHAPTER 17

THE TREATMENT OF OUTLIERS

17-1 THE PROBLEM OF REJECTING OBSERVATIONS

Every experimenter, at some time, has obtained a set of observations, purportedly taken under the same conditions, in which one observation was widely different, or an outlier from the rest.

The problem that confronts the experimenter is whether he should keep the suspect observation in computation, or whether he should discard it as being a faulty measurement. The word reject will mean *reject in computation*, since every observation should be recorded. A careful experimenter will want to make a record of his "rejected" observations and, where possible, detect and carefully analyze their cause(s).

It should be emphasized that we are not discussing the case where we *know* that the observation differs because of an assignable cause, i.e., a dirty test-tube, or a change in operating conditions. We are dealing with the situation where, as far as we are able to ascertain, all the observations are on approximately the same footing. One observation is suspect however, in that it seems to be set apart from the others. We wonder whether it is not so far from the others that we can reject it as being caused by some assignable but thus far unascertained cause.

When a measurement is far-removed from the great majority of a set of measurements of a quantity, and thus possibly reflects a gross error, the question of whether that measurement should have a full vote, a diminished vote, or no vote in the final average — and in the determination of precision — is a very difficult question to answer completely in general terms. If on investigation, a trustworthy explanation of the discrepancy is found, common sense dictates that the value concerned should be excluded from the final average and from the estimate of precision, since these presumably are intended to apply to the unadulterated system. If, on the other hand, no explanation for the apparent anomalousness is found, then common sense would seem to indicate that it should be included in computing the final average and the estimate of precision. Experienced investigators differ in this matter. Some, e.g., J. W. Bessel, would always include it. Others would be inclined to exclude it, on the grounds that it is better to exclude a possibly "good" measurement than to include a possibly "bad" one. The argument for exclusion is that *when a "good" measurement is excluded* we simply lose some of the relevant information, with consequent decrease in precision and the introduction of some bias (both being theoretically computable); whereas, *when a truly anomalous measurement is included* it vitiates our results, biasing both the final average and the estimate of precision by unknown, and generally unknowable, amounts.

There have been many criteria proposed for guiding the rejection of observations. For an excellent summary and critical review of the classical rejection procedures, and some more modern ones, see P. R. Rider[1]. One of the more famous classical rejection rules is "Chauvenet's criterion," which is not recommended. This criterion is based on the normal distribution and advises rejection of an extreme observation if the probability of occurrence of such deviation from the mean of the n measurements is less than $1/2n$. Obviously, for small n, such a criterion rejects too easily.

A review of the history of rejection criteria, and the fact that new criteria are still being proposed, leads us to realize that no completely satisfactory rule can be devised for any and all situations. We cannot devise a criterion that will not reject a predictable amount from endless arrays of perfectly good data; the amount of data rejected of course depends on the rule used. This is the price we pay for using any rule for rejection of data. No available criteria are superior to the judgment of an experienced investigator who is thoroughly familiar with his measurement process. For an excellent discussion of this point, see E. B. Wilson, Jr.[2]. Statistical rules are given primarily for the benefit of inexperienced investigators, those working with a new process, or those who simply want justification for what they would have done anyway.

Whatever rule is used, it must bear some resemblance to the experimenter's feelings about the nature and possible frequency of errors. For an extreme example — if the experimenter feels that about one outlier in twenty reflects an actual blunder, and he uses a rejection rule that throws out the two extremes in every sample, then his reported data obviously will be "clean" with respect to extreme blunders — but the effects of "little" blunders may still be present. The *one and only* sure way to avoid publishing any "bad" results is to throw away all results.

With the foregoing reservations, Paragraphs 17-2 and 17-3 give some suggested procedures for judging outliers. In general, the rules to be applied to a single experiment (see Paragraph 17-3) reject only what would be rejected by an experienced investigator anyway.

17-2 REJECTION OF OBSERVATIONS IN ROUTINE EXPERIMENTAL WORK

The best tools for detection of *errors* (e.g., systematic errors, gross errors) in routine work are the control charts for the mean and range. These charts are described in Chapter 18, which also contains a table of factors to facilitate their application, Table 18-2.

17-3 REJECTION OF OBSERVATIONS IN A SINGLE EXPERIMENT

We assume that our experimental observations (except for the truly discordant ones) come from a single normal population with mean m and standard deviation σ. In a particular experiment, we have obtained n observations and have arranged them in order from lowest to highest ($X_1 \leq X_2 \leq \ldots \leq X_n$). We consider procedures applicable to two situations: when observations which are either too large or too small would be considered faulty and rejectable, see Paragraph 17-3.1; when we consider rejectable those observations that are extreme in one direction only (e.g., when we want to reject observations that are too large but never those that are too small, or vice versa), see Paragraph 17-3.2. The proper choice between the situations must be made on *a priori* grounds, and not on the basis of the data to be analyzed.

For each situation, procedures are given for four possible cases with regard to our knowledge of m and σ.

17-3.1 WHEN EXTREME OBSERVATIONS IN EITHER DIRECTION ARE CONSIDERED REJECTABLE

17-3.1.1 Population Mean and Standard Deviation Unknown — Sample in Hand is the Only Source of Information.

[The Dixon Criterion]

Procedure

(1) Choose α, the probability or risk we are willing to take of rejecting an observation that really belongs in the group.

(2) If:

$3 \leq n \leq 7$	Compute r_{10}
$8 \leq n \leq 10$	Compute r_{11}
$11 \leq n \leq 13$	Compute r_{21}
$14 \leq n \leq 25$	Compute r_{22},

where r_{ij} is computed as follows:

r_{ij}	If X_n is Suspect	If X_1 is Suspect
r_{10}	$(X_n - X_{n-1})/(X_n - X_1)$	$(X_2 - X_1)/(X_n - X_1)$
r_{11}	$(X_n - X_{n-1})/(X_n - X_2)$	$(X_2 - X_1)/(X_{n-1} - X_1)$
r_{21}	$(X_n - X_{n-2})/(X_n - X_2)$	$(X_3 - X_1)/(X_{n-1} - X_1)$
r_{22}	$(X_n - X_{n-2})/(X_n - X_3)$	$(X_3 - X_1)/(X_{n-2} - X_1)$

(3) Look up $r_{1-\alpha/2}$ for the r_{ij} from Step (2), in Table A-14.

(4) If $r_{ij} > r_{1-\alpha/2}$, reject the suspect observation; otherwise, retain it.

17-3.2 WHEN EXTREME OBSERVATIONS IN ONLY ONE DIRECTION ARE CONSIDERED REJECTABLE

17-3.2.1 Population Mean and Standard Deviation Unknown — Sample in Hand is the Only Source of Information.

[The Dixon Criterion]

Procedure

(1) Choose α, the probability or risk we are willing to take of rejecting an observation that really belongs in the group.

(2) If:

$3 \leq n \leq 7$	Compute r_{10}
$8 \leq n \leq 10$	Compute r_{11}
$11 \leq n \leq 13$	Compute r_{21}
$14 \leq n \leq 25$	Compute r_{22},

where r_{ij} is computed as follows:

r_{ij}	If Only Large Values are Suspect	If Only Small Values are Suspect
r_{10}	$(X_n - X_{n-1})/(X_n - X_1)$	$(X_2 - X_1)/(X_n - X_1)$
r_{11}	$(X_n - X_{n-1})/(X_n - X_2)$	$(X_2 - X_1)/(X_{n-1} - X_1)$
r_{21}	$(X_n - X_{n-2})/(X_n - X_2)$	$(X_3 - X_1)/(X_{n-1} - X_1)$
r_{22}	$(X_n - X_{n-2})/(X_n - X_3)$	$(X_3 - X_1)/(X_{n-2} - X_1)$

(3) Look up $r_{1-\alpha}$ for the r_{ij} from Step (2), in Table A-14.

(4) If $r_{ij} > r_{1-\alpha}$, reject the suspect observation; otherwise, retain it.

TABLE A-14. CRITERIA FOR REJECTION OF OUTLYING OBSERVATIONS

Statistic	Number of Observations, n	Upper Percentiles						
					.95	.98		
r_{11}	10				.477	.551		
r_{21}	11				.576	.638		
	12				.546	.605		
	13				.521	.578		
r_{22}	14				.546	.602		
	15				.525	.579		
	16				.507	.559		
	17				.490	.542		
	18				.475	.527		
	19				.462	.514		
	20				.450	.502		
	21				.440	.491		
	22				.430	.481		
	23				.421	.472		
	24				.413	.464		
	25				.406	.457		

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